Application Number: 10/821,769
Amendment Dated: November 23, 2005

Listing of the Claims

1. (currently amended) A fiber-reinforced composite spring comprising:

a spring wire comprising:

a core that includes a plurality of fiber tows ~~twisted about a longitudinal axis to create a contoured core surface~~; and

an outer layer of resin that is substantially devoid of ~~said~~ the fiber tows, wherein ~~said~~ the resin outer layer ~~being formed by twisting said core to remove a portion of said resin from said core, having that varies along the longitudinal axis to form a generally uniform outer surface about the core and having a cross-section having a substantially constant diameter whereby~~ has a constant thickness and cross-sectional shape, and is generally uniform and free of any surface irregularities, thereby yielding a ~~the~~ spring that has a predictable rate of deformation when subjected to a compressive load.

2. (original) The spring of claim 1, wherein the core is disposed within the spring wire at a generally central location.

3. (cancelled)

4. (currently amended) The spring of claim 1, wherein ~~said~~ the spring has a generally circular ~~cross-section~~ cross-sectional shape.

5. (original) The spring of claim 4, wherein the core is generally concentric with the generally uniform outer surface such that the core is located at a substantially constant radial distance from the generally uniform outer surface for a cross-section of the spring wire taken at a point along the longitudinal axis.

6. (cancelled)

7. (currently amended) The spring of claim 1, wherein the core has a rectangular-cross sectional shape and the core has a the central axis that is generally coaxial with a central axis of the spring wire such that the central axis of the core is located at an approximately equal radial distance from opposing planar surfaces of the ~~rectangular cross section of the~~ generally uniform outer surface of the rectangular-shaped core.

8. (currently amended) The spring of claim 1, wherein ~~said~~ the fiber tows are natural fibers selected from the group consisting of jute and rayon fibers.

9. (currently amended) The spring of claim 1, wherein ~~said~~ the fiber tows are synthetic fibers selected from the group consisting of glass, carbon, boron, boron, silicon carbide, aluminum oxide, quartz, alumina-silica, alumina-boria-silica, zerconia-silica, and fused silica fibers.

10. (currently amended) The spring of claim 1, wherein ~~said~~ the resin is a thermoplastic resin.

11. (currently amended) The spring of claim 1, wherein ~~said~~ the resin is a thermosetting resin selected from the group consisting of epoxy, bis-maleimide, polyimide, polyester, vinyl ester resins, polyether, ether ketone, polyphenylene sulfide, polyetherimide, and polyamide imide resins.

12. (currently amended) A fiber-reinforced composite spring formed by a process comprising the steps of:

impregnating a plurality of fiber tows with a resin to form a core;

encasing at least a portion of ~~said~~ the core within a cavity having desired interior dimensions;

forming an outer resin layer on ~~said~~ the core by removing a portion of ~~said~~ the resin from ~~said~~ the impregnated fiber tows by twisting ~~said~~ the core within the cavity to form a spring wire ~~having a cross-section having a substantially constant diameter~~ where the resin outer layer has a constant thickness and cross-sectional shape, and is generally uniform and free of any surface irregularities, and whereby the spring has a predictable rate of deformation when subjected to a compressive load; and

shaping ~~said~~ the spring wire to form a spring.

13. (currently amended) The spring of claim 12, wherein ~~said~~ the step of encasing at least a portion of ~~said~~ the core within ~~said~~ the cavity comprises the steps of:

providing a generally planar sheet of flexible shroud material;

placing ~~said~~ the core in contact with ~~said~~ the sheet of shroud material;

wrapping ~~said~~ the sheet of shroud material around ~~said~~ the core; and

securing a first portion of ~~said~~ the sheet of shroud material to a second portion of ~~said~~ the sheet of shroud material to form ~~said~~ the cavity around the core.

14. (currently amended) The spring of claim 12, wherein ~~said~~ the step of impregnating ~~said~~ the plurality of fiber tows with ~~said~~ the resin comprises the step of:

impregnating ~~said~~ the plurality of fiber tows with a thermoplastic resin.

15. (currently amended) The spring of claim 14, wherein the step of encasing at least a portion of ~~said~~ the core within ~~said~~ the cavity comprises the steps of:

at least partially solidifying ~~said~~ the thermoplastic resin to minimize smearing of ~~said~~ the resin while encasing ~~said~~ the core;

inserting ~~said~~ the core and ~~said~~ the at least partially solidified thermoplastic resin into ~~said~~ the cavity; and

exposing ~~said~~ the thermoplastic resin within ~~said~~ the cavity to a suitable source of energy for liquefying ~~said~~ the at least partially solidified thermoplastic resin within ~~said~~ the cavity.

16. (currently amended) The spring of claim 15, wherein ~~said~~ the cavity is an interior passage defined by a shroud of flexible material that is to encase ~~said~~ the spring wire.

17. (currently amended) The spring of claim 12, wherein ~~said~~ the process further comprises the steps of:

at least partially solidifying ~~said~~ the resin in the spring shape within ~~said~~ the cavity; and

removing ~~said~~ the spring wire from ~~said~~ the cavity.

18. (currently amended) The spring of claim 17, wherein ~~said~~ the resin is a thermosetting resin.

19. (currently amended) The spring of claim 18, wherein ~~said~~ the step of at least partially solidifying ~~said~~ the resin within ~~said~~ the cavity includes the steps of:

wrapping ~~said~~ the spring wire around a mandrel; and

at least initiating crosslinking of the thermosetting resin.

20. (currently amended) The spring of claim 12, wherein the step of shaping ~~said~~ the spring wire to form ~~said~~ the spring comprises wrapping ~~said~~ the spring wire encased within ~~said~~ the cavity around a mandrel.

21. (cancelled)

22. (cancelled)

23. (cancelled)

24. (cancelled)

25. (cancelled)

26. (cancelled)

27. (cancelled)

28. (cancelled)

29. (cancelled)

30. (cancelled)